PATENT SPECIFICATION (11) 1 496 540

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(32) Filed 25 March 1974 in
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E1R 18A

(19)

(54) SEALING AND SPACING UNIT FOR MULTIPLE GLAZED WINDOWS

PATENTS ACT 1949

SPECIFICATION NO 1496540

The following corrections were allowed under Section 76 on 10 February 1978.

Page 1, line 53 and 93, *for* Specification *read* Specifications

Page 4, line 24, *for* in *read* at

Page 5, line 14 and 108, *delete* to *insert* and

Page 5, line 63, *for* adhesive (second occurrence) *read* adhesives

Page 7, line 15, *for* sheet *read* sheets

Attention is also directed to the following printers errors:-

Page 2, line 121, *after* in *delete* a

Page 3, line 126, *delete* by *insert* of

Page 4, line 84, *for* thermogrip *read* THERMOGRIP

Page 6, line 18, *delete* carriage *insert* carrier

Page 6, line 68, *for* comprise *read* comprises

Page 6, line 89, *for* dehydration *read* dehydrator

THE PATENT OFFICE
21 March 1978

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adhesive. Also, United States Patent Specification No. 3,791,910 discloses that the sealant composition can be a cold flowable, butyl rubber-based sealant composition.

Although the above-mentioned sealing dehydrator element to the carrier strip and preventing it from undulating when a composite strip is coiled for packaging or bent around 90-degree corners in multiple glazed windows. In the aforementioned United States Patent Specification Nos. 3,758,996 and 3,791,910, a hot melt

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(54) SEALING AND SPACING UNIT FOR MULTIPLE GLAZED WINDOWS

(71) We, PPG INDUSTRIES, INC., a corporation organized and existing under the laws of the State of Pennsylvania, United States of America, of One Gateway Center, Pittsburgh, State of Pennsylvania 15222, United States of America, (assignee of RENATO JOSEPH MAZZONI and GEORGE HENRY BOWSER), do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to sealing and spacing means for multiple glazed window units.

United States Patent Specifications Nos. 3,657,900 and 3,699,785 disclose sealing and spacing means for multiple glazed windows. Such sealing and spacing means consists of flexible carrier strips such as aluminum foil, and adhered to one side of the carrier strip is an elongated ribbon of sealant material and an elongated resilient spacer-dehydrator element secured to the carrier strip through the sealant. The carrier strip is slightly wider than the ribbon of sealant and the sealant wider than the spacer-dehydrator element. Each of the three elements are coextensive in length and symmetrically disposed on either side of a centerline through the length of the composite element. Examples of suitable sealant compositions are butyl rubber-based sealants, such as are disclosed in United States Patent Specification No. 2,974,377.

United States Patent Specifications Nos. 3,758,996 and 3,791,910 disclose similar sealing and spacing means for multiple glazed windows and also disclose that the sealant composition can be a hot melt adhesive. Also, United States Patent Specification No. 3,791,910 discloses that the sealant composition can be a cold flowable, butyl rubber-based sealant composition.

Although the above-mentioned sealing and spacing means provide definite advantages in fabricating multiple glazed windows, there are certain shortcomings associated with these sealing and spacing means. As mentioned in both of United States Patent Specification Nos. 3,657,900 and 3,699,785 the butyl sealants, although providing air-tight, durable seals, are not particularly good adhesives. When the composite element is coiled for packaging and shipping with the spacer-dehydrator element nearest the core of the coil, the spacer-dehydrator element moves relative to the sealant causing the spacer-dehydrator to assume a wavy or undulatory appearance. The butyl sealant does not have sufficient adhesive properties to hold the spacer-dehydrator element to the carrier tape in a straight line alignment. When the sealing and spacing unit is removed from the package and unrolled, the wavy spacer-dehydrator can only be straightened with difficulty. Also, when the sealing and spacing unit of the prior art is applied to spaced-apart glass sheets and bent around 90-degree corners at the ends of the sheets, the mastic will not adequately secure a spacer-dehydrator to the carrier tape and the spacer-dehydrator will "bunch together" putting stress on the corners of the multiple glazed window and at times permitting the bunched spacer-dehydrator to extend into the viewing area. To avoid this problem, a notch of the spacer-dehydrator element must be removed from the corner areas of the composite element.

The above problems can be overcome if the sealant composition is one which has strong adhesive and cohesive properties, thereby firmly securing the spacer-dehydrator element to the carrier strip and preventing it from undulating when a composite strip is coiled for packaging or bent around 90-degree corners in multiple glazed windows. In the aforementioned United States Patent Specification Nos. 3,758,996 and 3,791,910, a hot melt

SPECIFICATION AMENDED - SEE ATTACHED SLIP

adhesive is recommended for the sealant compositions. Hot melt adhesives have very strong adhesive and cohesive properties making them attractive candidates for securing the spacer-dehydrator to the carrier strip. Unfortunately, hot melt adhesives have a number of shortcomings associated with them for use in sealing multiple glazed window units. First of all, the hot melt adhesives are not nearly as good sealants as are the butyl rubber-based materials. They are more rigid and are not nearly as durable as butyl rubber-based materials and hot melt adhesives are pervious to moisture vapor. In addition, hot melt adhesives are not cold flowable and are only flowable when heated.

With hot melt adhesives, the composite sealing and spacing element or the glass must be heated so as to cause the hot melt adhesive to flow into hermetically sealing contact with the edges of the glass sheets. Heating either the composite element or the glass presents a definite assembling disadvantage. Further, heating may cause deformation of the flexible spacer-dehydrator element and also may cause unwanted condensation in the interior of the multiple glazed unit upon cooling of the heated member. With the butyl sealants, on the other hand, mere pressure at room temperature is sufficient to cause the sealant to flow into hermetically sealing contact with the edges of the glass sheets. With the cold flowable butyl sealants disclosed in United States Patent Specification No. 3,791,910, very light pressure such as from a hand roller is all that is necessary.

From the above consideration of the prior art, it appears that there is a need for an improved sealing and spacing unit for multiple glazed windows.

According to the present invention there is provided a sealing and spacing unit for multiple glazed windows which comprises an elongated, flexible, moisture-impervious base;

an elongated, preformed, elastic spacer dehydrator element having a preshaped cross-section adapted for insertion between opposed marginal edges of a pair of rigid parallel sheets of a multiple glazed window, the spacer-dehydrator element comprising a moisture vapor transmittable, polymeric matrix having finely-divided particles of desiccant dispersed throughout the matrix; a thin layer of a vulcanized adhesive which is solid and not cold flowable at room temperature for securing said spacer-dehydrator element to said base in a substantially contiguous lengthwise manner; and a strip of cold flowable, non-vulcanized, moisture vapor impervious, sealant composition disposed on said base on both sides of the spacer-dehydrator element.

The present invention also provides a multiple glazed window which comprises two spaced-apart glass sheets arranged in generally parallel relation, and the sealing and spacing element circumscribing the perimeter of the glass sheets, spacing them apart from one another and sealing their edges, the sealing and spacing element comprising an elongated, flexible, moisture-impervious base circumscribing the perimeter of the glass sheet and overlapping their marginal edges;

an elongated, preformed elastic spacer-dehydrator element disposed between opposing surfaces of the rigid sheets adjacent to their peripheral marginal edges, the spacer-dehydrator element being adapted to conform to the shape of the space between, and defined by, the opposing surfaces of the glass sheets so as to maintain them in spaced relation, the spacer-dehydrator element comprising a moisture vapor transmittable, polymeric matrix having finely divided particles of a desiccant dispersed throughout the matrix; a thin layer of a vulcanized adhesive which is solid and not cold-flowable at room temperature for securing said spacer-dehydrator element to said base; and a strip of cold flowable, non-vulcanized, moisture vapor impervious, sealant composition disposed on said base on both sides of the spacer-dehydrator element and circumscribing and overlapping peripheral edges of the two spaced-apart glass sheets.

Thus by means of the present invention there is provided a sealing and spacing unit which comprises an elongated, flexible, moisture-impervious base or ribbon, a sealant and a spacer-dehydrator element which can be applied to the peripheral edges of spaced-apart glass sheets and which will hermetically seal the edges of the glass sheets by merely pressing the unit to the edges of the glass sheets so as to flow the sealant into hermetically sealing contact with the edges of the glass sheets; further, the unit is one in which the spacer-dehydrator element is firmly adhered to the ribbon so that it is maintained in a straight alignment and does not take on a wavy or undulating appearance when the composite unit is coiled for packaging or bent around 90 degree corners in a multiple glazed window units.

The elongated, flexible, moisture-impervious base is preferably a strip of aluminum foil having a thickness of about 5 to 12 mils.

The adhesive is usually a hot melt adhesive, preferably a polymer or copolymer of ethylene. Examples of suitable copolymers are ethylene/acrylic

acid copolymers and ethylene/vinyl acetate copolymers.

The dehydrator strip comprises a moisture vapor transmitting, elastic, polymer matrix having finely divided particles of desiccant material dispersed throughout the matrix. The dehydrator strip may comprise a particulate desiccant such as a crystalline zeolite dispersed through a moisture permeable, elastic, polymer matrix, such as an ethylene/ethyl acrylate copolymer.

Preferably the non-vulcanized sealant composition is spaced slightly apart from the spacer-dehydrator element. The non-vulcanized sealant composition is preferably an admixture of polybutene and two different molecular weight polyisobutylenes. The non-vulcanized sealant composition may comprise the following ingredients:

Ingredient	Percent by Weight
polyisobutylene (viscosity average molecular weight 8,000 to 100,000)	15—50
polyisobutylene (viscosity average molecular weight 8,000 to 10,000)	10—45
polybutene	20—50
carbon black	10—45
silica pigment	5—15
zirconium orthosilicate	5—15
zinc oxide	0—5
gamma-glycidoxy-propyl-trimethoxysilane	0—5

The present invention will now be further illustrated, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 shows in perspective a coiled strip of the sealing and spacing unit of the present invention;

Figure 2 shows a cross-sectional view of the sealing and spacing unit of the present invention;

Figure 3 is a cross-sectional, elevational view of a multiple glazed window employing the sealing and spacing unit of the present invention; and

Figure 4 shows in cross-section an alternative embodiment of the sealing and spacing unit of the present invention.

Referring to the Figures, the sealing and spacing unit of the invention 6 comprises an elongated, moisture-impervious, flexible base or ribbon 1 having an elongated, preformed, resilient, dehydrator strip 4 adhered to one side thereof through a thin layer 3 of an adhesive. Spaced on either side of the dehydrator strip 4 and on the same side of tape 1 as the dehydrator strip 4 are two strips 2 of a cold flowable, mastic, sealant composition. In a preferred embodiment of the invention, the strips of cold flowable, mastic sealant are spaced slightly apart from the dehydrator strip, although they could be positioned flush to the dehydrator strip. Also, the mastic sealant strips 2 are approximately equal in width as shown in Figures 1, 2 and 3 when the two sheets of glass in the multiple glazed window will be of equal width. However, where one of the glass sheets will be much thicker than the other, an unbalanced sealing and spacing unit such as shown in Figure 4 can be used.

In the construction of multiple glazed windows, such as illustrated in Figure 3, a continuous length of a spacer-sealant assembly is placed around the periphery of a pair of spaced-apart, generally parallel glass sheets 5 to provide an insulating air space between the sheets. The glass sheets are separated at their marginal edges by the continuous spacer-dehydrator element 4. Hermetic sealing of the insulating air space is accomplished by the moisture-resistant mastic 2 adhering the ribbon 1 to the peripheral edges of the glass sheets completely around the periphery of the window. A hand roller may be conveniently used to press the mastic 2 into sealing contact with the peripheral and/or marginal edges of the glass sheets and any flowing of the mastic that may occur is intended to be concealed by the slightly greater width of carrier tape 1 over the mastic strips 2. Besides the hand roller, an automated mechanical apparatus for hermetically sealing the multiple glazed windows may be used such as is disclosed in United States Patent Specification No. 3,733,237.

For use in the present invention, the carrier ribbon 1 is composed of any moisture-impervious, flexible material. An example would be a 5 to 12 mil thickness of aluminum foil. Another example would be a strip of flexible, moisture-impervious, plastics material such as polyethylene or polypropylene. Preferred is a 5—12 mil thick strip of aluminum foil which is coated on the interior surface (that is, the same surface on which the dehydrator strip is positioned) with a thin coating, e.g., 0.5 to 5 mils of polyethylene. The interior coating of polyethylene provides for better adhesion of the spacer-dehydrator element to the ribbon 1.

The dehydrator strip 4 is an elongated, preformed strip of elastic, polymeric material and has a preshaped cross-section adapted for insertion between opposed marginal edges of a pair of rigid, parallel sheets of a multiple glazed unit. The dehydrator strip is formed by a moisture vapor transmittable, elastic, polymeric matrix having finely divided particles of desiccant material dispersed throughout

the matrix. The spacer-dehydrator element is described in detail in United States Patent Specification No. 3,758,996.

The spacer-dehydrator element 4 is secured to the flexible carrier strip 1 by a thin layer 3, that is, about 1 to 10 mils, of an adhesive. Preferred is a hot melt adhesive. By the term "hot melt adhesive" is meant a bonding agent which achieves a solid state and resultant strength by cooling, as contrasted with other adhesives which achieve the solid state through evaporation or removal of solvents. Prior to heating, a hot melt adhesive is a thermoplastic, 100 percent solid material, all adhesive. Application of heat brings the material to the liquid state, and after removal of the heat, it sets by simple cooling.

The hot melt adhesive is employed in the practice of the invention mainly because of the economic reasons associated with process speed, simplicity and mechanization. Hot melt adhesives are also used because of the speed in which they produce a bond. In the practice of the invention, economics indicate that the bond between the flexible carrier tape and the spacer-dehydrator element develop very quickly because of the packaging considerations. Also, the use of hot melts eliminates the cost of solvents used with solvent-based adhesives. In addition, solvent-based adhesives could not be used in the practice of the invention because the binding mechanism of the solvent-based adhesive depends upon the evaporation of solvent. Solvent evaporation in the proximity of the dehydrator strip could pose problems because of the desiccant contained within the dehydrator. The desiccant may absorb the solvent vapors and thereby be contaminated with the further possibility of releasing the vapors into the interior space of the multiple glazed unit thereby ruining the appearance of the unit.

Examples of suitable hot melt adhesives include coumarone-indene resins, rosin and its derivatives, mineral, vegetable and petroleum waxes, alkyds, terpene resins, heat-stable phenol-formaldehyde resins.

All of these hot melt adhesives have typically low strength and melt easily to low viscosity fluids. To be converted into useful adhesives, they are reinforced or toughened by blending with limited proportions of high molecular weight polymers selected from the following: ethyl cellulose, polyvinyl acetate and its derivatives, butyl methacrylates, polyethylene, polystyrene, and styrene copolymers such as styrene-butadiene copolymers, and polyisobutylene.

The finished adhesives usually contain, additionally, some proportion of a liquid plasticizer, resinous or monomeric. The natural asphalts and the vegetable and coal-tar pitches also represent base materials useful as hot melt adhesives, alone or in compounds.

The most preferred hot melt adhesives are compounded from polyethylene, polyvinyl acetate and its derivatives and a polyamide derived from dimerized fatty acids and diamines. Particularly preferred hot melt adhesives are ethylene acrylic acid copolymers sold by Union Carbide Corporation under the trade name EAA9300; ethylene vinyl acetate copolymers sold by E. I. du Pont de Nemours and Company (Inc.) under the trademark Elvax; and hot melt adhesives sold by U.S.M. Corporation under the trademark thermogrip. (See, for example, United States Patent Specification No. 3,283,890).

The hot melt adhesives are available in many different forms. Some of these are tapes, cords and ribbons, films or thin sheets, granules, pellets and various shapes such as cylinders and cubes and blocks.

The hot melt adhesives employed in the practice of the present invention are vulcanized solids at room temperature and are capable of being stored and handled easily without blocking. Their color is ordinarily light and upon heating they melt sharply and flow freely. Further, the hot melt adhesives used in the present invention are stable to prolonged heating and able to withstand local overheating. The hot melt adhesives used in the present invention should have some flexibility over a fairly wide temperature range that the multiple glazed window would be expected to encounter and use. Accordingly, the hot melt adhesive should have a measure of flexibility over the temperature range of −30°F to 170°F. By "flexibility" of the hot melt adhesive is meant that it can withstand the normal working (movement of the components of the multiple glazed unit relative to one another due to differences in thermal expansion coefficients) of the multiple glazed unit over the temperature range of −30°F to 170°F without cracking. In addition, the hot melt adhesives employed in the invention should firmly secure the elastic, polymeric, spacer-dehydrator element to the elongated base.

In liquid melt form, the hot melt adhesive is applied in bead or ribbon form to a preheated strip of the carrier tape by a nozzle, wheel or spray. Ordinarily, the temperature of application will depend upon the hot melt adhesive selected. Its point of solidification should be such that ample time would be available to close the bond between the carrier tape and the spacer-dehydrator element with only

minimal pressure. The bond accomplished with the hot melt adhesive is strong. Accordingly, after the adhesive has cooled and set, the 180-degree peel strength between the spacer-dehydrator element and the carrier strip should be at least 25 pounds per lineal inch as determined by A.S.T.M. D-903-49T. Ordinarily, with the polymeric matrix materials mentioned in the aforementioned United States Patent Specification No. 3,758,996, the adhesive bond will be stronger than the cohesive strength of the polymeric matrix. Thus, 180-degree peel strengths between 25 to 40 pounds per lineal inch resulting in cohesive failure of the spacer-dehydrator element usually result.

In general, equipment for applying hot melts is of two principal types: a melt reservoir type and a progressive feed type. In the former, a quantity of the adhesive is melted in a pot and delivered by a metering pump from the pot to a heated nozzle. The hot melt adhesive for this system comes in the form of blocks, chips or granules. A charge is put into the melting pot, heated to a predetermined temperature under thermostatic control, and the melt is fed to a nozzle or cementing wheel by a pump.

In the progressive feed applicator, the adhesive is supplied as a flexible, grooved, cylindrical cord coiled on wheels. The rate of feed of the cord is synchronized with the rate of delivery of the melt through an application nozzle. In between the feed end and the nozzle, the adhesive passes around a heated melt wheel running in an eccentric groove. A melt chamber is formed, in fact, by a small tubular space between the wheel and the casing. The internal capacity of the unit is so small that only a few grams of material are held above the melt temperature within the applicator. The use of thermostatically controlled heating elements located at carefully selected points enables the adhesive to be maintained at its maximum application temperature without overheating. The width of the bonds may be controlled by the design of the nozzle or applying wheel by the relationship between the rate of adhesive output and the speed of the moving aluminum foil.

Besides hot melt adhesives, other adhesives which do not depend on evaporation or removal of solvents for developing the adhesive bond could be used. Examples of suitable alternative adhesives which could be used are those which depend on polymerization or crosslinking of polymer chains for hardening and the development of the adhesive bond. Examples of such adhesive include phenolic and resorcinol resin adhesives and cyanoacrylate adhesives. Such adhesives, like the hot melt adhesive, are vulcanized and solid at room temperature and are not cold flowable. It should be clear that by the term "adhesive" as used in the specification and claims, a material different from the non-vulcanized cold flowable, sealant composition is intended.

Referring once again to the Figures, the sealant composition 2 is a non-vulcanized, cold flowable composition which is air and moisture vapor impervious. By the term "moisture vapor impervious" is meant that the sealant has moisture vapor transmissions of less than 8 and preferably less than 5 grams/24 hours/square meter/mil at 100°F, 90 percent relative humidity as determined by A.S.T.M. E-96-66, Method E. Examples of suitable cold flowable, non-vulcanized, sealant compositions are disclosed in United States Patent Specification No. 3,791,910.

Such sealant compositions are room temperature vulcanizable, butyl rubber-based sealants. As has been mentioned, the above-mentioned sealant compositions are vulcanizable, that is, as they are initially prepared, they are not cured or vulcanized but will only become cured upon prolonged exposure to room temperature or upon a shorter exposure to a higher temperature. Unfortunately, the most expeditious manner of fabricating the sealing and spacing units of the present invention results in vulcanization of the above-mentioned butyl sealants before the sealing and spacing units are applied to the glass edges of the multiple glazed windows. As will be described in more detail later, the vulcanizable butyl sealant is applied to the carrier tape almost simultaneously with the hot melt adhesive. The hot melt adhesive is applied at a temperature between 450 to 475°F and this heat in such close proximity with the vulcanizable butyl sealant will quickly vulcanize it. Once vulcanized, the butyl sealant does not readily cold flow and high pressure equipment such as clamps, rigid spacers and the like will be required to flow the vulcanized sealant across the edges of the glass of the multiple glazed unit to form a hermetic seal.

Therefore, a non-vulcanizable, cold flowable, moisture resistant, non-vulcanized, sealant composition would be desirable in a sealing and spacing unit of the present invention. The sealing composition which has been found to be preferred has the following composition:

Ingredient	Percent by Weight
polyisobutylene (viscosity average molecular weight 75,000 to 125,000)	15—50
polyisobutylene (viscosity average molecular weight 5,000 to 15,000)	10—45
carbon black	10—45
silica pigment	5—15
zirconium orthosilicate	5—15
polybutene	20—50
zinc oxide	0—5
gamma-glycidoxy-propyl-trimethyoxysilane	0—5

The above sealing composition has no curing agent and is non-vulcanizable. It can be applied to the carriage strip before or simultaneously with the hot melt adhesive without danger of premature curing or vulcanization. In fact, if the sealing and spacing unit is to be applied to glass edges of a multiple glazed unit shortly after it is made, the heat from the hot melt adhesive will actually encourage the preferred sealant composition to flow more readily and thus provide for better sealing properties.

The sealing and spacing unit 6 such as is shown in the enclosed Figures can be assembled somewhat as follows: A roll of carrier tape 1, such as aluminum foil, is positioned in the beginning of the assembly line and is unrolled, passing beneath a 3½ inch National Rubber Machinery rubber extruder with a split die which extrudes the non-vulcanized sealant composition in bead or ribbon form 2 to the edges of the carrier tape 1. Shortly thereafter or simultaneously therewith, the carrier tape with the sealant passes over a bank of radiant heaters to preheat the aluminum foil to an elevated temperature, that is, about 250 to 400°F. Immediately thereafter, the hot melt adhesive 3 is applied to the carrier tape between the two ribbons of non-vulcanized sealant composition. The spacer-dehydrator element 4 which is coiled on a roll above the moving strip of foil is then immediately applied with the aid of a roller to the bead hot melt adhesive forming a thin film of hot melt between the carrier tape and the spacer-dehydrator. Optionally, additional rollers further down the assembly line may be used to press the spacer-dehydrator element and carrier strip together to better wet them out with hot melt adhesive. The hot melt is permitted to cure, to solidify or set whereupon it forms a secure bond between the carrier tape and the spacer-dehydrator. The sealing and spacing unit can then be coiled for packaging or applied directly to glass edges of a multiple glazed unit as generally described above.

WHAT WE CLAIM IS:—

1. A sealing and spacing unit for multiple glazed windows which comprise an elongated, flexible, moisture-impervious base;

an elongated, preformed, elastic spacer-dehydrator element having a preshaped cross-section adapted for insertion between opposed marginal edges of a pair of rigid, parallel sheets of a multiple glazed window, the spacer-dehydrator element comprising a moisture vapor transmittable polymeric matrix having finely-divided particles of desiccant dispersed throughout the matrix; a thin layer of a vulcanized adhesive which is solid and not cold flowable at room temperature for securing said spacer-dehydrator element to said base in a substantially contiguous lengthwise manner; and

a strip of cold flowable non-vulcanised moisture vapor impervious, sealant composition disposed on said base on each side of said spacer dehydration element.

2. A unit as claimed in claim 1 in which the elongated, moisture-impervious base is a strip of aluminum foil having a thickness of 5 to 12 mils.

3. A unit as claimed in claim 1 or 2 in which the adhesive is a hot melt adhesive.

4. A unit as claimed in claim 3 in which the hot melt adhesive is a polymer or copolymer of ethylene.

5. A unit as claimed in claim 4 in which the hot melt adhesive is selected from ethylene/acrylic acid copolymers and ethylene/vinyl acetate copolymers.

6. A unit as claimed in any of claims 1 to 5 in which the non-vulcanized sealant composition is spaced slightly apart from and disposed on both sides of the spacer-dehydrator element.

7. A unit as claimed in any of claims 1 to 6 in which the non-vulcanized sealant composition is of the following composition:

Ingredient	Percent by Weight
polyisobutylene (viscosity average molecular weight 75,000 to 125,000)	15—50
polyisobutylene (viscosity average molecular weight 5,000 to 15,000)	10—45
polybutene	20—50
carbon black	10—45
silica pigment	5—15
zirconium orthosilicate	5—15
zinc oxide	0—5
gamma-glycidoxy-propyl-trimethyoxysilane	0—5

8. A sealing and spacing unit substantially as hereinbefore described with particular reference to and as illustrated in any of the accompanying drawings.

9. A multiple glazed window which comprises two spaced-apart glass sheets arranged in generally parallel relation, and a sealing and spacing element circumscribing the perimeter of the glass sheets, spacing them apart from one another and sealing their edges, the sealing and spacing element comprising: an elongated, flexible, moisture-impervious base circumscribing the perimeter of the glass sheet and over-lapping their marginal edges;

an elongated preformed, elastic spacer-dehydrator element disposed between opposing surfaces of the rigid sheets adjacent to their peripheral marginal edges, the spacer-dehydrator element being adapted to conform to the shape of the space between, and defined by, the opposing surfaces of the glass sheets so as to maintain them in spaced relation, the spacer-dehydrator element comprising a moisture vapor transmittable, polymeric matrix having finely divided particles of desiccant dispersed throughout the matrix, a thin layer of a vulcanized adhesive which is solid and not cold-flowable at room temperature for securing said spacer-dehydrator element to said base; and

a strip of cold flowable, non-vulcanized, moisture vapor impervious, sealant composition disposed on said base on both sides of the spacer-dehydrator element and circumscribing and over-lapping peripheral edges of the two spaced-apart glass sheets.

10. A window as claimed in claim 9 in which the flexible, moisture-impervious base is a strip of aluminum foil having a thickness of 5 to 12 mils.

11. A window as claimed in claim 9 or 10 in which the adhesive is a hot melt adhesive.

12. A window as claimed in claim 11 in which the hot melt adhesive is a polymer or copolymer of ethylene.

13. A window as claimed in claim 12 in which the hot melt adhesive is selected from ethylene/acrylic acid copolymers and ethylene/vinyl acetate copolymers.

14. A window as claimed in any of claims 9 to 13 in which the non-vulcanized sealant composition is spaced slightly apart from and disposed on both sides of the spacer-dehydrator element.

15. A window as claimed in any of claims 9 to 14 in which the non-vulcanized sealant has the following composition:

Ingredient	Percent by Weight
polyisobutylene (viscosity average molecular weight 75,000 to 125,000)	15—50
polyisobutylene (viscosity average molecular weight 5,000 to 15,000)	10—45
polybutene	20—50
carbon black	10—45
silica pigment	5—15
zirconium orthosilicate	5—15
zinc oxide	0—5
gamma-glycidoxypropyl-trimethyoxysilane	0—5

16. A multiple glazed window substantially as hereinbefore described with particular reference to and as illustrated in the accompanying drawings.

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Liverpool, L1 3AB.
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1496540 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

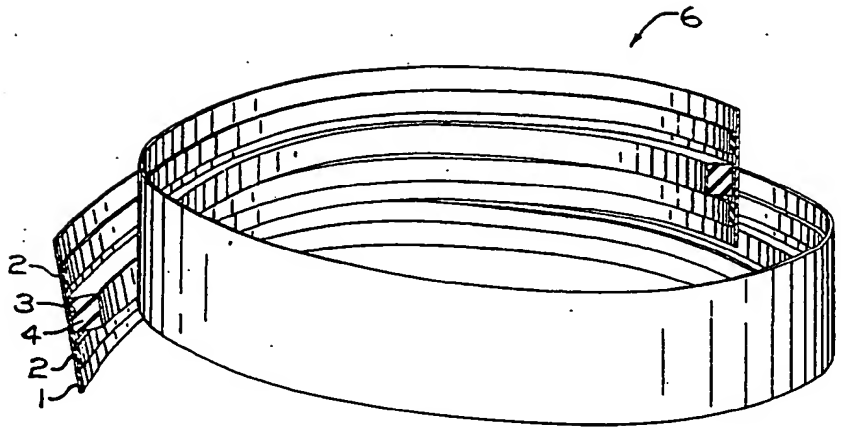

FIG.1

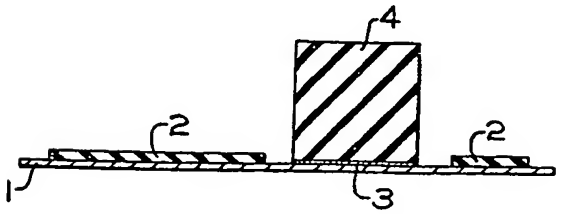

FIG.4

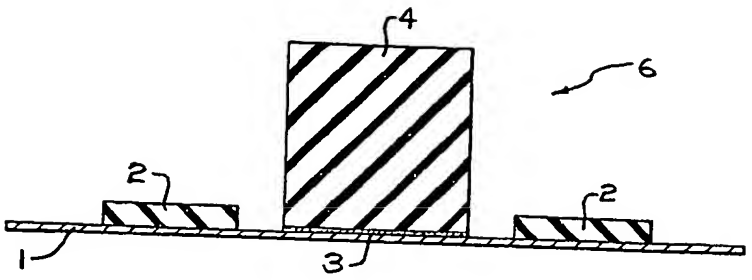

FIG.2

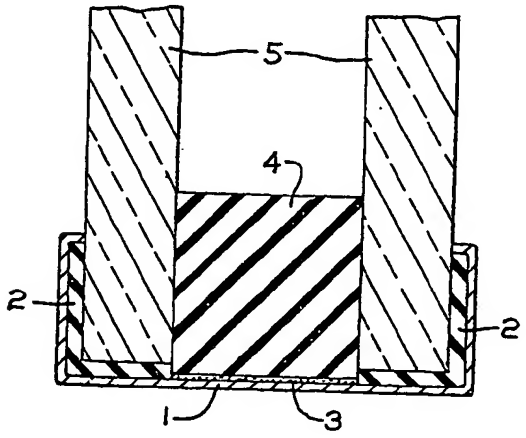

FIG.3